WE CLAIM:

1.   A method for determining a position of a first electrode placed within a left ventricle area of a heart, the method comprising the steps of:

detecting a first depolarization event within the heart;

5   sensing, with the first electrode, a second depolarization event within the heart;

measuring a first interval between the first depolarization event and the second depolarization event; and

determining from at least the first interval whether the first electrode has a

10   lateral/posterior position or an anterior position within the left ventricle.

2.   The method of claim 1, wherein the step of determining whether the first electrode has a lateral/posterior position or an anterior position comprises comparing the first interval to a threshold and determining a lateral/posterior position when the

15   first interval is greater than the threshold.

3.   The method of claim 1, wherein a second electrode is placed in a right ventricle area of the heart and the first depolarization event is detected by sensing a peak of a QRS complex at the second electrode.

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4.   The method of claim 1, wherein a second electrode is placed in an atrium region of the heart and the first depolarization event is detected by sensing depolarization at the second electrode.

25   5.   The method of claim 1, wherein the first depolarization event is detected by sensing an onset of a QRS complex at the first electrode.

6.   The method of claim 1, wherein the step of sensing the second depolarization event with the first electrode comprises sensing a peak of a QRS complex at the first

30   electrode.

7.   The method of claim 1, further comprising:

detecting a third depolarization event within the heart;

measuring a second interval between the third depolarization event and the second depolarization event; and

5   wherein the step of determining whether the first electrode has a lateral/posterior position or an anterior position comprises computing a probability value for the first electrode position based at least on the first interval and the second interval and determining the electrode position from at least the probability value.

10   8.   The method of claim 7, wherein the first depolarization event occurs in an atrial area of the heart prior to the second and third depolarization events, the second depolarization event is a QRS complex peak in a left ventricle area of the heart, and the third depolarization event is a QRS complex peak in a right ventricle area of the heart occurring before or after the second depolarization event.

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9.   The method of claim 7, wherein the first depolarization event occurs in an atrial area of the heart prior to the second and third depolarization events, the second depolarization event is a QRS complex peak in a left ventricle area of the heart, and the third depolarization event is an onset of a QRS complex in the left ventricle area

20   of the heart occurring before the second depolarization event.

10.   The method of claim 7, wherein the first depolarization event is an onset of a QRS complex in a left ventricle area of the heart occurring prior to the second depolarization event, the second depolarization event is a QRS complex peak in the

25   left ventricle area of the heart, and the third depolarization event is a QRS complex peak in a right ventricle area of the heart occurring before or after the second depolarization event.

11. The method of claim 1, wherein the step of determining the lead position based on an evaluation of at least the first intervals comprises the step of:

computing a probability (P) of the lead position being in an anterior position according to the equation

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$$P = \frac{1}{1 + \exp[-0.5(d_L - d_A]} \, .$$

wherein d_A is an approximation of a probability density function of the

10 electrode being in the anterior position, d_L is an approximation of a probability density function of the electrode being in a lateral/posterior position, $Q^* \, R_L$ is the first interval in milliseconds, and wherein

$$d_A = 0.001(Q^* \, R_L - 70)^2, \text{ and}$$
$$d_L = 0.001(Q^* \, R_L - 130)^2 \, .$$

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12. The method of claim 1, wherein the step of determining the lead position based on an evaluation of at least the first intervals comprises the step of:

computing a probability (P) of the lead position being in an anterior position according to the equation

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$$P = \frac{1}{1 + \exp[-0.5(d_L - d_A]} \, .$$

wherein d_A is an approximation of a probability density function of the

25 electrode being in the anterior position, d_L is an approximation of a probability density function of the electrode being in a lateral/posterior position, $R_R \, R_L$ is the first interval in milliseconds, and wherein

$$d_A = 0.0005(R_R \, R_L - 20)^2, \text{ and}$$
$$d_L = 0.0005(R_R \, R_L - 80)^2 \, .$$

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13.   A method for determining a position of an electrode within a left ventricle of a heart, the method comprising the steps of:

detecting a first depolarization event within the heart;

sensing, with the electrode, a second depolarization event within the heart;

5   measuring a first interval between the first depolarization event and the second depolarization event;

detecting a third depolarization event within the heart;

measuring a second interval between the third depolarization event and the second depolarization event; and

10   determining the electrode position based on an evaluation of the first and the second intervals.

14.   The method of claim 13, wherein the first depolarization event is an onset (Q^*) of the QRS complex detected by the electrode prior to the second depolarization

15   event, the second depolarization event is a QRS complex peak (R_L) detected by the electrode, and the third depolarization event is a QRS complex peak (R_R) detected in a right ventricle region of the heart before or after the second depolarization event.

15.   The method of claim 13, wherein the first depolarization event is an atrial

20   activity (A) occurring prior to the second and third depolarization events, the second depolarization event is a QRS complex peak (R_L) detected by the electrode, and the third depolarization event is an onset (Q^*) of the QRS complex detected by the electrode prior to the second depolarization event.

25   16.   The method of claim 13, wherein the first depolarization event is an atrial activity (A) occurring prior to the second and third depolarization events, the second depolarization event is a QRS complex peak (R_L) detected by the electrode, and the third depolarization event is a QRS complex peak (R_R) detected in a right ventricle region of the heart before or after the second depolarization event.

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17.   The method of claim 13, wherein the step of determining the lead position based on an evaluation of the first and second intervals comprises the step of:

computing a probability (P) of the lead position being in an anterior position according to the equation

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$$P = \frac{1}{1 + \exp[-0.5(d_L - d_A)]}.$$

wherein d_A is an approximation of a probability density function of the electrode being in the anterior position, d_L is an approximation of a probability

10   density function of the electrode being in a lateral/posterior position, $R_R R_L$ is the first interval in milliseconds, $Q^* R_L$ is the second interval in milliseconds, and wherein

$$d_A = 0.004(Q^* R_L + R_R R_L - 100)^2, \text{ and}$$
$$d_L = 0.004(Q^* R_L + R_R R_L - 200)^2.$$

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18.   A system for determining the position of a first electrode in a left ventricle area of a patient's heart, comprising:

one or more detection devices for detecting at least first and second electrical events in the patient's heart, one of the one or more detection devices being

5   electrically connected to the first electrode and detecting the second electrical event in the left ventricle area; and

a processing device in electrical communication with the one or more detection devices, the processing device configured to calculate a first interval between the first and second electrical events and determine the position of the

10   electrode based at least upon the first interval.

19. The system of claim 18, wherein a second electrode is positioned in an atrium area of the patient's heart, one of the one or more detection devices being electrically connected to the second electrode and detecting the first electrical event in the atrium

15   area prior to the detection of the second electrical event, and wherein the second electrical event is a left ventricle QRS complex peak.

20. The system of claim 18, wherein a second electrode is positioned in a right ventricle area of the patient's heart, one of the one or more detection devices being

20   electrically connected to the second electrode and detecting the first electrical event in the right ventricle area before or after the detection of the second electrical event, and wherein the first electrical event is a right ventricle QRS complex peak and the second electrical event is a left ventricle QRS complex peak.

25   21. The system of claim 18, wherein the first electrode detects the first electrical event, the first electrical event being an onset of a left ventricle QRS complex, and wherein the second electrical event is a left ventricle QRS complex peak.

22. A system for determining the position of a first electrode in a left ventricle area of a patient's heart, comprising:

　　means for detecting a first electrical event within the patient's heart;

　　means for detecting a second electrical event occurring at the first electrode;

5　and

　　means for determining whether the first electrode has an anterior or lateral/posterior position within the left ventricle based at least on a first interval between the first and second electrical events.

10　23. The system of claim 22, wherein the second electrical event is a peak of a QRS complex at the first electrode and the first electrical event is atrial activity.

24. The system of claim 22, wherein the second electrical event is a peak of a QRS complex at the first electrode and the first electrical event is an onset of a QRS

15　complex.

25. The system of claim 22, wherein the second electrical event is a peak of a QRS complex at the first electrode and the first electrical event is a peak of a right ventricle QRS complex occurring before or after the second electrical event.

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26. A method for assisting installation of an electrode in a left ventricle of a patient's heart, the method comprising the steps of:

　　placing the electrode in a coronary sinus vein branch of the left ventricle;

　　detecting a plurality of electrical events in the patient's heart during a heart

25　beat, wherein at least one of the plurality of electrical events is sensed by the electrode;

　　determining from the plurality of electrical events whether the electrode has an anterior or a lateral/posterior vein branch position during the heart beat; and

　　displaying on a display screen an indication of the determined position of the

30　electrode.

27. The method of claim 26, wherein the plurality of electrical events include an onset of a QRS complex at the electrode and a peak of the QRS complex at the electrode, wherein determining the vein branch position comprises computing an

interval between the onset and the peak, and wherein the indication on the display screen includes displaying the interval and ranges for the interval for each vein branch position.

5   28. The method of claim 26, wherein the plurality of electrical events include a right ventricle QRS complex peak and left ventricle QRS complex peak at the electrode, wherein determining the vein branch position comprises computing an interval between the right ventricle QRS complex peak and the left ventricle QRS complex peak, and wherein the indication on the display screen includes displaying the interval

10   and ranges for the interval for each vein branch position.

       29. The method of claim 26, wherein the plurality of electrical events include atrial activity and a left ventricle QRS complex peak at the electrode, wherein determining the vein branch position comprises computing an interval between the atrial activity

15   and the left ventricle QRS complex peak, and wherein the indication on the display screen includes displaying the interval and ranges for the interval for each vein branch position.

       30. A method for installing an electrode of a VRT device in a left ventricle of a

20   patient's heart, the method comprising the steps of:

              placing the electrode in a coronary sinus vein branch of the left ventricle;

              detecting a plurality of electrical events in the patient's heart during a heart beat, wherein at least one of the plurality of electrical events is sensed by the electrode;

25   determining from the plurality of electrical events whether the electrode has an anterior or a lateral/posterior vein branch position during the heart beat; and

              adjusting settings used by the VRT device based upon the determined position of the electrode.

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31. The method of claim 30, wherein the plurality of electrical events include an onset of a QRS complex at the electrode and a peak of the QRS complex at the electrode, and wherein determining the vein branch position comprises computing an interval between the onset and the peak.

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32. The method of claim 30, wherein the plurality of electrical events include a right ventricle QRS complex peak and a left ventricle QRS complex peak at the electrode, and wherein determining the vein branch position comprises computing an interval between the right ventricle QRS complex peak and the left ventricle QRS complex

10   peak.

33. The method of claim 30, wherein the plurality of electrical events include atrial activity and a left ventricle QRS complex peak at the electrode, and wherein determining the vein branch position comprises computing an interval between the

15   atrial activity and the left ventricle QRS complex peak.